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No. 17,487/34.

APPLICATION DATED

8th May, 1934.

Applicant (Actual Inventor) ... Arnold NEASITT MACNICOL.
Application and Provisional Specification Accepted, 15th June, 1934.
Complete Specification Accepted, 10th June, 1935.
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Class 12.3.

Drawing attached.

COMPLETE SPECIFICATION.

"Improved method of and apparatus for separating particles of different specific gravities and recovering those desired."

I, ARNOLD NEASITT MACNICOL, of No. 11 Phillip Street, Sydney, in the State of New South Wales and Commonwealth of Australia, Consulting Engineer, hereby declare this invention and the manner in which it is to be performed to be fully described and ascertained in and by the following statement:

This invention relates to the separation of 10 particles of different specific gravities and recovery of those desired, and has been specially devised in order to provide an improved method of and apparatus whereby the desired particles whether the 15 heavier or lighter may be separated and recovered.

The improved method of separating particles of different specific gravities constituting finely ground material and recovering 20 those desired comprises the discharge of a mixture of material constituted of finely ground particles and a suitable liquid into a rapidly rotating vessel having a plurality of axially spaced and circumferentially 25 arranged and inwardly disposed riffles which may be in any convenient form such as, shoulders, ridges, grooves or channels, but preferably inwardly open recesses so that the heavier particles, such as gold, which attain 30 a higher velocity than lighter particles

during centrifugalization, will reach and lodge in or upon the riffles before the lighter particles, and then removing the lighter particles by discharging washing liquid, generally water, radially or at suitable angle 5 or angles in the direction of the wall and riffles thereof to stir, diffuse and carry such particles from the vessel, and when the construction of the vessel is suitable, allowing the heavier particles to pass from the 10 recesses through the wall of the vessel into a receiver therefor.

The mixture of the material is made of finely ground particles and water as a liquid, but where required and or suitable according to the nature of the particles to be separated and to be recovered, the liquid may be water with its density increased by the addition of suitable substance or substances, such as salt, or natural salt water 20 may be used if readily available, or the liquid may be of a viscous nature, such as oil or glycerine, or of a lighter nature, such as benzine or alcohol, and when the nature of the particles is suitable, rubatanes having 25 a selective affinity for desired particles may be added to the liquid, and when a collecting medium, such as mercury, is applied to the vessel, the liquid may have added thereto cleansing substances, such as acid, alkali, or 30

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gaponaceous substances, in order to obtain desired, the supply connection to the mix-particles in the mixture to facilitate or pressure pipe may have therein a regulatable pipe their separation by or amalgamation valve or control adapted and arranged to be with the collecting medium or suitable but mechanically operated as desired, in order balance having dissolving effect may be added so that the supply of mixture may be inter-to the mixture to act upon the particles and sufficient to that such mixture will be dis-5-6-solved material may be recovered later charged into the vessel intermittently or in from the overflow.

The improved apparatus according to this invention comprises a vessel whose depth or length is preferably greater than its diameter, which is adapted to be rapidly rotated upon its axis, which may be vertical or horizontal, or at any angle therebetween, so that has upon or in the inner walls of the vessel a plurality of axially spaced and circumferentially arranged inwardly disposed ribs, preferably in the form of inwardly fluted, preferably in the form of inwardly open recesses either formed integral therewith or in emplaceable and removable rings, so that into channels provided thereto and in order that the invention and principles of the recesses may have when suitable to the heavier particles to be separated according to the nature and presence thereof 20 in the material, an escape outlet through which the vessel preferably from the deepest position of the recess, so that lighter particles may pass through the vessel into a receiver provided therefor, and means may be provided for closing or screening and opening 25 for uncovering all the orifices, so that they may be closed and opened or screened and uncovered at suitable stages of the centrifugalization and or separation of the 30 material between the axially spaced ribs, may be corrugated or fluted, or ribbed, or any desired or suitable combination of such, a longitudinal section of a 35 vessel, either depending therefrom or attached thereto, which is rotatably mounted on a suitable bearing, such as by guide them to the flutes, and thence through a hollow shaft 12 and bearings 13, 40 vessel, either depending therefrom or attached thereto, gear 14 or a pulley on the rotated or to be stationary, simple piping means, has overflow openings 15 with which one for supply and discharge of the mixture, may be associated a receiving trough 16 across the vessel, and the other for discharge of the mixture through a discharge or direction spout 17, also 45 and through the mixture into the bottom opening 18 at the bottom into the vessel, all of which may be connected to a suitable pipe 19. On the inner face 50 of the vessel, there are a plurality of axially spaced particles, particularly lighter which may be overlying larger particles, and circumferentially arranged particles in the vessel, when pipe having 55 all of the vessel is provided with ribs, nozzles at desired peripherally and axial 60 positions and disposed in a slanting manner, as 19 in Figures 1, 21, 22 and 23, or at an angle or angles in relation to the wall of the vessel, which preferably are constituted of 65 the vessel and of the vessel are of windings 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 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1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1

which are inclinedly reduced from the corner of the trailing side wall 23 and the back of the top wall 24, where they are deepest, to the front edge 26 and the opposite side edge 27 which is the top of the trailing wall 23 of the next recess, and at the deepest position of each there is a small escape orifice 28 through the wall of the vessel. In order that all such orifices may be closed and opened as desired, the outer face of the wall of the vessel is formed with a flat 28 theron, and a slidably cover ring 29 operable by convenient means such as arms 30 upon a bar 31 which may be moved by any suitable means, not shown, are provided. When it is desired to screen and uncover said orifices the ring may be provided with holes therethrough to juxtapose with the orifices 28, though they may be 20 larger, and be covered with suitable filtering and/or straining material.

To facilitate manufacture of the vessel and/or the removal of contents of the recesses 10 some are formed in a separate ring 32 which may be in sections and a channel 33 be formed in the vessel wall to receive said ring 32 which would be provided with a socket or sockets 34 to engage a rib or pins 35 in the channel 33 to assure 30 juxtapositioning of the orifices 28 and orifices 36 through the wall.

Inside the vessel are supply and discharge pipes, one for the mixture and others for washing liquid, which may conveniently be concentric pipes, an inner one 37 and an outer one 38, both adapted to be connected to supply and to be rotated, though if desired, they may be stationary. The former 37 for connection to mixture supply and having an enlargement or chamber 39 on its inner end with a plurality of peripherally spaced discharge openings disposed at a suitable angle or angles, such as vertical, horizontally, and axially spaced positions, such openings 40 may be of other desired shapes. In the modified construction as in Figure 6, a plurality thereof may be positioned at circumferentially spaced positions in the vessel. In the modified construction as in Figure 6, about the escape orifices 36 through the wall of the vessel each discharge retarding trough 42 is rotated the discharge from the orifices.

The rilles 21 in the wall of the vessel 10 may be formed as in Figure 4 with an inward projection 43 to provide a flat 44, a slight recess 45 at the outer end of the flat 44 and an inward slope 46 from said recess 45 to the next projection 43; or as in Figure 6 the rilles 22 are formed above 16 outwardly and upwardly spaced or stepped channeling the wall, a plugged drain hole 47 being provided, if required, for convenience in cleaning.

The vessel has a drain passage 18 at the bottom into hollow 20 shaft 12 or into a pipe, not shown, about said shaft, for passage of the heavier particles when they are sluiced out at terminations of separation. As in Figure 7 the rille 21 formed by projections 48 having forward and rearward faces flat.

The vessel as in Figure 7 which is shown vertically axisized may be horizontally disposed at any angle therobetween, and the supply pipes 37 and 38 will be suitably disposed therein.

In operation, the vessel being rotated at a suitable speed, the mixture is supplied whether by gravity or at desired pressure to the pipe 37 and discharged through the openings 40 in the direction of the wall of the vessel and/or the rilles thereof, and following decantation the heavier particles are removed through the opening 16 before lighter particles.

Before lighter particles are removed through the opening 16, the lighter particles, or some of them, covering chamber 39, have been washed liquid.

which is supplied at desired pressure to pipe 38 is discharged into the mixture pipe 37 through narrow slots 40 through the vertical wall portion of the vessel causing movement therein 16 and the outer pipe 38 terminating at the chamber 39 and having a plurality of discharge openings, such as narrow axially oriented slots 41 through its wall, a portion of them overlying the elongated slots 40.

When the mixture is being carried away in the overflow 50, the lighter particles in the mixture, particularly of the lighter particles which are or may be overlying the heavier particles in the rilles, such lighter particles being carried away in the overflow 50, have not required, or when they are not required, to be removed through the opening 16 and discharged if so employed.

When separating pipes are provided for the preparation for further separation and/or 50 washing liquid they may be stationary, or in place the overflow is directed into another vessel for further separation and/or 50

over any desired particle.

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and/or metal in solution, or to a launder for settlement and thereafter gathering of such particles.

Having now fully described and explained my said invention and the manner in which it is to be performed, I declare that what I claim is—

1. Improved method of separating particles of different specific gravities and recovering those desired, consisting in the centrifugalization of a mixture of such particles and liquid discharged into a suitably rotated vessel towards its wall which is adapted to receive and retain the heavier particles, and discharging washing liquid into the mixture in said vessel to cause agitation therein and separation and/or diffusion of the lighter particles so that said particles will be carried off in the overflow from said vessel.

2. Improved method of separating particles of different specific gravities and recovering those desired, consisting in discharging a mixture of the particles and liquid towards the wall of a suitably rotated vessel which is adapted to receive and retain the heavier particles and discharging and diffusing the lighter particles in the mixture by discharging washing liquid into the mixture at desired pressure at any desired angle towards said wall and allowing said lighter particles to be carried off in the overflow from said vessel.

3. Improved method of separating particles of different specific gravities and recovering those desired as in Claim 1, in which the vessel is discharged into which the vessel has ribbed corrugations or the vessel intermittently to admit a filling of the like between the axially pulatory effect therein.

4. Improved method of separating particles of different specific gravities and recovering those desired as in Claim 1, in which the mixture is increased by the addition of suitable substance or substances.

5. Improved method of separating particles of different specific gravities and recovering those desired as in Claim 1, in which the liquid forming the mixture is of a viscous nature.

6. Improved method of separating particles of different specific gravities and recovering those desired as in Claim 1, in which the liquid forming the mixture is of a light nature, such as benzine or alcohol.

7. Improved method of separating particles of different specific gravities and recovering those desired as in Claims 1 and 6, in which ingredients having an affinity for some of the particles to be separated are added to the liquid forming the mixture.

8. Improved method of separating particles of different specific gravities and recovering those desired as in Claims 1 and 2, in which ingredients having a cleansing and/or dissolving effect upon particles, or some of them, in the mixture are added to said mixture.

9. Improved method of separating particles of different specific gravities and recovering those desired as in Claims 1 and 2, in which the vessel is first supplied with a collecting medium, such as mercury.

10. Improved method of separating particles of different specific gravities and recovering those desired, substantially as described and explained.

11. Improved apparatus for separating particles of different specific gravities and recovering those desired, comprising a rotatable vessel having a plurality of axially spaced and circumferentially arranged ruffles upon the inner face of its wall, and mixture supply and washing liquid supply pipes inside said vessel respectively adapted at any desired angle towards said wall and discharge mixture and a washing liquid allowing said lighter particles to be carried off in the overflow from said vessel.

12. Improved apparatus for separating particles of different specific gravities and recovering those desired as in Claim 11, in which the mixture is discharged into which the vessel has ribbed corrugations or the vessel intermittently to admit a filling of the like between the axially pulatory effect therein.

13. Improved apparatus for separating particles of different specific gravities and recovering those desired as in Claim 11, in which the ruffles are in the form of inwardly disposed ruffles and disposed at an angle or

40 degree of different specific gravities and recovering those desired as in Claim 11, in which the ruffles are formed above upwardly spaced and outwardly stepped channels.

14. Improved apparatus for separating particles of different specific gravities and recovering those desired as in Claim 11, in which the ruffles are formed above upwardly spaced and outwardly stepped channels.

15. Improved apparatus for separating particles of different specific gravities and

recovering those desired as in Claim 11, in which the riffles are in the form of upwardly or forwardly flat and downwardly or rearwardly sloped projections.

16. Improved apparatus for separating particles of different specific gravities and recovering those desired as in Claim 11, in which the riffles are in the form of a plurality of circumferentially divided inwardly open and rearwardly deepened recesses.

17. Improved apparatus for separating particles of different specific gravities and recovering those desired as in Claim 11, in which the riffles are in the form of inwardly open recesses in the wall of the vessel and are outwardly deepened to an escape orifice through said wall.

18. Improved apparatus for separating particles of different specific gravities and recovering those desired as in Claims 11 and 17, in which means are provided for closing or screening and opening or uncovering the outer ends of the escape

25 orifices.

19. Improved apparatus for separating particles of different specific gravities and recovering those desired as in Claims 11 and 17, in which a discharge retarding trough is formed upon or with the wall of the vessel about the outer ends of the escape orifices.

20. Improved apparatus for separating particles of different specific gravities and 35 recovering those desired, comprising the

combination and arrangement of the integers substantially as described and explained with reference to Figure 1 of the drawings.

21. Improved apparatus for separating 5 particles of different specific gravities and recovering those desired, comprising the combination and arrangement with the other main integers as described, of a vessel having the riffles formed with the wall substantially as described and explained with reference to Figure 4 of the drawings.

22. Improved apparatus for separating particles of different specific gravities and recovering those desired, comprising the combination and arrangement with the other main integers as described, of a vessel having the riffles formed with the wall substantially as described and explained with reference to Figure 5 of the drawings.

23. Improved apparatus for separating particles of different specific gravities and recovering those desired, comprising the combination and arrangement with the other main integers as described, of a vessel having the riffles formed with the wall substantially as described and explained with reference to Figure 6 of the drawings.

Dated the sixteenth day of March, A.D. 1935.

Attest—Number: Macicoll
By his Patent Attorney,
Percy Newell.

Witness—Graham Newell.



